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(54) OPTICAL RECORDING MEDIUM AND ITS PRODUCTION

(57)Abstract:

PROBLEM TO BE SOLVED: To decrease the production time, to obtain stable reflectance from an initial rewriting process and to provide a write-once phase-change type optical recording medium without requiring initialization in a (Ge,Sb)-Te phase- change type optical recording medium in which the initialization treatment of the recording layer is the rate determining step in the production.

SOLUTION: This optical recording medium has a recording layer comprising at least one Te-based thin film and at least one reaction thin film on a transparent substrate, and the Te-based thin film is in contact with the reaction thin film. The Te-based thin film is produced by forming a Te-based material containing ≥95 at.% Te. The reaction thin film is produced by forming a (Ge, Sb) material essentially comprising Ge and/or Sb. By mixing the reaction thin film material and Te, a phase-change recording material is produced. After the recording layer is formed, the layer is irradiated with continuous laser light to mix the Te-based thin film material and the reaction thin film material.

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CLAIMS

[Claim(s)]
[Claim 1] It has the recording layer which consists of a Te system thin film of at least one layer, and a reaction thin film of at least one layer on a transparence substrate. Te system thin film and the reaction thin film have touched, and Te system thin film forms Te system ingredient which contains Te more than 95 atom %. The optical recording medium which is what a reaction thin film forms the system ingredient which uses germanium and/or Sb as a principal component (germanium, Sb), and a phase change record ingredient generates by mixing with a reaction thin film component and Te.
[Claim 2] The optical recording medium of claim 1 which Te system thin film is crystallizing.
[Claim 3] Either [at least] Te system ingredient or (germanium, Sb) a system ingredient is Element M (M). aluminum, Si, Ti, V, Cr, Mn, Fe, Co, nickel, Cu, Zn, Y, Zr, Nb, Mo, Ru, Rh, Pd, Ag, Cd, In, Sn, The optical recording medium of claims 1 or 2 whose element M content of Te system ingredient at least one sort of La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Hf, Ta, W, Au, Tl, Pb, and Bi is contained, and the element M content in a recording layer is below pentatomic %, and is below pentatomic %.
[Claim 4] One optical recording medium of claims 1-3 whose thickness of Te system thin film is 7nm or more.
[Claim 5] One optical recording medium of claims 1-4 whose relation between the reflection factor R0 immediately after manufacture, the reflection factor RC in the crystalline substance section of the recording layer after repeat record, and the minimum reflection factor RA in the amorphous section of the recording layer after repeat record is RA<R0 <=RC when a reflection factor is measured from a transparence substrate side.
[Claim 6] One optical recording medium of claims 1-5 which cannot crystallize a record mark when mixing with Te system thin film component and a reaction thin film component arises by laser light exposure, and a record mark is formed and laser light is irradiated with the linear velocity at the time of record mark formation.
[Claim 7] The manufacture approach of an optical recording medium of having mixed down stream processing which performs mixing with Te system thin film component and a reaction thin film component by irradiating the recording layer of one optical recording medium of claims 1-5 with a continuous laser light.
[Claim 8] The manufacture approach of the optical recording medium of claim 7 controlled to become 0.2 VW<=VM in mixed down stream processing to the linear velocity VW of the recording layer to the laser light when rewriting the linear velocity VM of the recording layer to laser light.
[Claim 9] The manufacture approach of the optical recording medium of claim 8 controlled to become VW<=VM.
[Claim 10] The manufacture approach of an optical recording medium of having the process which is the approach of manufacturing one optical recording medium of claims 1-6, and is heat-treated at 50-120 degrees C after the record stratification.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical recording medium and its manufacture approach of a phase change mold.
[0002]
[Description of the Prior Art] In recent years, the optical recording medium [high density record is possible and] which can moreover eliminate and rewrite recording information attracts attention. Among the optical recording media of a rewritable mold, by irradiating laser light, the thing of a phase change mold records by changing the crystallized state of a recording layer, and is reproduced by detecting reflection factor change of the recording layer accompanying such a change of state. The optical recording medium of a phase change mold, and it is observed from being applied to DVD-RAM. [by modulating the reinforcement of a single light beam]
[0003] By the crystalline substance condition and the amorphous state, since the stability of that the difference of a reflection factor is large and an amorphous state is comparatively high, -Te system ingredient which uses germanium-Te, Sb-Te, and germanium-Sb-Te as a principal component (germanium, Sb) is used for the optical recording medium of a phase change mold in many cases.
[0004] In the conventional phase change mold optical recording medium, since the recording layer is formed using vacuum membrane formation equipment etc., the recording layer immediately after formation is an amorphous substance-like. To use this as an erasable medium, it is necessary to crystallize a recording layer by actuation generally called initialization.
[0005] How to heat a substrate and crystallize to the crystallization temperature of a recording layer, after membrane formation as the approach of initialization, (JP,2-3131,A), the approach (JP,4-366424,A --) called solid phase initialization which irradiates a laser beam and is crystallized after membrane formation The substrate after forming flash plate light is irradiated using the optical property of a 2-201734 official report, a 3-76027 official report, and a chalcogen compound. the so-called light -- the approach (JP,4-281219,A) of crystallizing in false by melanism -- The approach of crystallizing by induction heating using a RF, the approach of heating a substrate and crystallizing during membrane formation, (JP,2-98847,A), After forming the dielectric of the 1st layer and forming a recording layer subsequently, this is heated, it crystallizes and the approach (JP,2-5246,A) of forming a dielectric further etc. is proposed.
[0006] However, initialization by laser-beam exposure requires long duration, and a problem is in productivity. Moreover, by the approach of heating the whole medium, there is a problem of being hard to use a cheap resin substrate. That is, a resin substrate will come to cause trouble to distortion, tracking, etc. with heating in the case of initialization processing. Moreover, by the approach using flash plate light, in order to crystallize thoroughly, the exposure of multiple times is required, and a problem is in productivity.
[0007] For this reason, current and being industrially used as a suitable approach are the approaches using the equipment called a bulk eraser. A bulk eraser is equipment which it irradiates [equipment],

without seldom extracting the beam of gas laser with a high output, or semiconductor laser, and crystallizes many trucks at once. Since a recording layer can be heated restrictively and the temperature rise of a substrate becomes small in a bulk eraser, utilization of a heat-resistant low resin substrate is possible.

[0008] However, in the bulk eraser, since several minute room [about] time amount is required even when initializing the optical recording disk of the diameter of 12cm, it is a rate-determining step in an optical recording disk production process.

[0009] It has proposed separating and establishing the process which these people face forming the recording layer of an In-Ag-Te-Sb system in Japanese Patent Application No. No. 47822 [seven to], and separates and establishes the process which carries out the spatter of Sb+In, and the process which carries out the spatter of Ag+Te in order to make unnecessary initialization processing needed with the conventional phase change mold record medium, or carries out the spatter of the Sb, the process which carry out the spatter of the In, and the process which carry out the spatter of Ag+Te. At least the part is crystallizing the recording layer formed of such a process. The recording layer formed by this approach performs repeat record, and the same reflection factor change as the case where the element in a layer is fully initialized with the above-mentioned bulk eraser by Ushiro who spread and mixed is obtained.

[0010] However, there is no publication about the approach of making small initialization energy of the phase change mold recording layer of a (germanium, Sb)-Te system in above-mentioned Japanese Patent Application No. No. 47822 [seven to]. Moreover, in the optical recording medium indicated by above-mentioned Japanese Patent Application No. No. 47822 [seven to], the rate of elimination is not stabilized like the conventional phase change mold record medium on the occasion of rewriting from immediately after formation to the several time. In the field which specifically rewrote with the field crystallized at the time of formation, and was sometimes crystallized, since reflection factors differ, a reflection factor is not stabilized until a rewriting field reaches all over a recording layer. In the mark edge record used with an erasable digital versatile disc (DVD-RAM) etc., when dispersion in such a reflection factor arises, the problem that it is taken for a mark edge may arise.

[0011] The phase change mold record medium which prepared the recording layer which becomes JP,8-106647,A from the AgInSbTe system artificial grid film with which the laminating of AgSbTe2 film and the In-Sb film was carried out by turns, or the laminating of AgSbTe2 film, In film, and the Sb film was carried out by turns is indicated. AgSbTe2 currently crystallized in this official report It is setting for the initialization energy of the whole recording layer to be slight, and to end, in order to use the film to one of the effectiveness.

[0012] However, about the approach of making small initialization energy of the phase change mold recording layer of a (germanium, Sb)-Te system, there is no publication in this official report. [0013] [Problem(s) to be Solved by the Invention] The object of this invention is realizing the reflection factor which shortened production time and was stabilized from the early stages of rewriting in -(germanium, Sb) Te system phase change mold optical recording medium which was a rate-determining step at the time of initialization processing of a recording layer being manufacture. Moreover, it is offering the phase change mold optical recording medium of the postscript mold which is not rewritable with the same linear velocity as the time of record unnecessarily [initialization processing] as for other objects of this invention.

[0014]

[Means for Solving the Problem] Such an object is attained by one configuration of following the (1) - (10).

(1) It has the recording layer which consists of a Te system thin film of at least one layer, and a reaction thin film of at least one layer on a transparence substrate. Te system thin film and the reaction thin film have touched, and Te system thin film forms Te system ingredient which contains Te more than 95 atom %. The optical recording medium which is what a reaction thin film forms the system ingredient which uses germanium and/or Sb as a principal component (germanium, Sb), and a phase change record ingredient generates by mixing with a reaction thin film component and Te.

(2) The optical recording medium of the above (1) which Te system thin film is crystallizing.

(3) Either [at least] Te system ingredient or (germanium, Sb) a system ingredient is Element M (M). aluminum, Si, Ti, V, Cr, Mn, Fe, Co, nickel, Cu, Zn, Y, Zr, Nb, Mo, Ru, Rh, Pd, Ag, Cd, In, Sn, La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Hf, Ta, W, The above (1) whose element M content of Te system ingredient at least one sort of Au, Tl, Pb, and Bi is contained, and the element M content in a recording layer is below pentatomic %, and is below pentatomic %, or (2) optical recording media.
(4) One optical recording medium of above-mentioned (1) - (3) whose thickness of Te system thin film is 7nm or more.
(5) transparence -- a substrate -- a side -- from -- a reflection factor -- having measured -- the time -- manufacture -- immediately after -- a reflection factor -- R -- zero -- a repeat -- record -- the back -- a recording layer -- a crystalline substance -- the section -- it can set -- a reflection factor -- RC -- a repeat -- record -- the back -- a recording layer -- amorphous -- the section -- it can set -- the minimum -- a reflection factor -- RA -- relation -- RA<R -- zero -- <= -- RC -- it is -- the above -- (-- one --) - (-- four --) -- either -- an optical recording medium .
(6) laser -- light -- an exposure -- Te -- a system -- a thin film -- a component -- a reaction -- a thin film -- a component -- mixing -- being generated -- record -- a mark -- forming -- having -- and -- record -- a mark -- formation -- the time -- linear velocity -- laser -- light -- having irradiated -- the time -- **** -- record -- a mark -- crystallization -- being impossible -- the above -- (-- one --) - (-- five --) -- either -- an optical recording medium .
(7) The above (1) The manufacture approach of an optical recording medium of having mixed down stream processing which performs mixing with Te system thin film component and a reaction thin film component by irradiating the recording layer of one optical recording medium of - (5) with a continuous laser light.
(8) The manufacture approach of the optical recording medium the above (7) controlled to become 0.2 VW<=VM in mixed down stream processing to the linear velocity VW of the recording layer to the laser light when rewriting the linear velocity VM of the recording layer to laser light.
(9)
The manufacture approach of the optical recording medium the above (8) controlled to become VW<=VM.
(10) The above (1) The manufacture approach of an optical recording medium of having the process which is the approach of manufacturing one optical recording medium of - (6), and is heat-treated at 50-120 degrees C after the record stratification.
[0015]
[Function and Effect] In the conventional (germanium, Sb)-Te system phase change mold record medium, it initializes by heating and annealing the amorphous recording layer of the monolayer formed of the spatter (crystallization). when it rewrites (over-writing) and the laser ** light is irradiated after initialization, in the field which added record power, a recording layer fuses and is amorphous by continuing quenching -- it is, it carries out and becomes a microcrystal, and a reflection factor falls and it becomes a record mark. On the other hand, in the field which added elimination power, change is not produced but the reflection factor after initialization is maintained. Also in the case of rewriting, record power is added by the part after this newly considered as a record mark, and elimination power is added to it by other parts. Even if the condition before an exposure is a crystalline substance, it is, and even if it carries out and is a microcrystal, all the amorphous parts of all that were, carried out, and became the record mark of a microcrystal, and added elimination power serve as a crystalline substance, and the over-writing record of the amorphous part which added record power is attained.
[0016] On the other hand, in the optical recording medium of this invention, after carrying out the laminating of Te system thin film and the reaction thin film, mixed processing is usually performed. This mixed processing is processing which heats a recording layer by laser light exposure etc., in order to mix Te system thin film configuration element and a reaction thin film configuration element. By mixed processing, a recording layer will be in the condition that amorphous phases, such as germanium-Sb, distributed in Te crystal phase. The reflection factor of a recording layer falls by mixed processing, although it is comparatively high before mixed processing because of Te system thin film currently

crystallized. However, the reflection factor after mixed processing becomes higher than the reflection factor in the amorphous section (record mark).

[0017] Mixed processing is the same as the initialization processing in the conventional phase change mold record medium in the semantics of making it change to the condition which can record the recording layer immediately after formation. However, although a recording layer is crystallized and a reflection factor goes up by the conventional initialization processing, in mixed processing, a recording layer will be in the condition that the amorphous substance was distributed in Te crystal phase, and a reflection factor will fall.

[0018] The same record and same rewriting (over-writing) as a phase change mold record medium of the above-mentioned former will be performed after mixed processing. In the field which added record power, a recording layer fuses, serves as an amorphous substance thru/or a microcrystal with continuing quenching, and serves as a record mark. On the other hand, in the field which added elimination power, crystallization to GeTe2 or Sb2Te3 grade arises, and a reflection factor rises. About rewriting after this, it is carried out like the above-mentioned conventional phase change mold record medium.

[0019] In this invention, after mixed processing, the record mark when repeating rewriting and reflection factor change of the crystalline substance section are small to the conventional phase change mold record medium and conventional EQC which initialized the amorphous recording layer of a monolayer, and its stability of a reflection factor is high.

[0020] Here, in the optical recording medium of this invention, if the reflection factor immediately after manufacture (before mixed processing) is set to R0, the reflection factor in the crystalline substance section of the recording layer after repeat record is set to RC and the minimum reflection factor in the amorphous section (record mark) of the recording layer after repeat record is set to RA, it will be set to RA<R0 <=RC. In addition, these reflection factors are the values measured from the substrate side. Moreover, the minimum reflection factor in the amorphous section is a value when amorphous-ization progresses most and a reflection factor becomes low most. Although the reflection factor R0 just behind the record stratification usually becomes lower than RC, it becomes comparatively high because of Te thin film currently crystallized as described above, for example, can be made into about 60% or more of RC. For this reason, focusing of laser light can be controlled with a sufficient precision in the case of mixed processing, and uniform mixed processing is attained. Moreover, when the reaction thin film is also being crystallized, R0 is made to RC and an EQC by making the optimal construction material of a dielectric layer or a reflecting layer which makes a presentation, thickness, etc. of both thin films the optimal, and is prepared in a medium front face with a recording layer, thickness, etc. In such a case, mixed processing is also omissible.

[0021] Since linear velocity of the medium at the time of a laser light exposure performing mixed processing can be made remarkably quicker than the linear velocity of the medium demanded in the case of the conventional initialization processing, by this invention, productivity improves, so that it may explain below.

[0022] In the conventional initialization processing, the amorphous recording layer of the monolayer formed of the spatter is heated and annealed, and it crystallizes. On the other hand, a record mark is heated and annealed also in case an amorphous record mark is eliminated by over-writing in a phase change mold record medium (it crystallizes). In that the recording layer and record mark immediately after formation are amorphous, although it is the same, in order that energy higher [since energy states differ] in case it is initialization may be needed and both may make a cooling rate late, a late linear velocity is needed. Here, it considers as the linear velocity which can rewrite the linear velocity from which the rate of elimination is set to -25dB or less in the case of over-writing, and if it is defined as the optimal linear velocity which can rewrite the linear velocity from which the rate of elimination becomes the best, a linear velocity required for initialization will become about 1 of the rewritable optimal linear velocity / three to 1/2. For this reason, in initializing by the exposure of laser light, it requires long duration.

[0023] On the other hand, in this invention, if linear velocity of the recording layer to the laser light in the case of mixed processing is set to VM and the optimal linear velocity in which rewriting after mixed

processing is possible is set to VW, it can do with VW<=VM. For this reason, the time amount which mixed processing takes becomes remarkably short rather than the time amount which the conventional initialization takes. In addition, what is necessary is just to raise the power of laser light in the case of mixed processing, in order to make linear velocity VM quick. Although there is especially no upper limit of VM, in using a common bulk eraser and a common recording device, it is usually set to VM<=5VW.

[0024] Moreover, if linear velocity VM is made late in the case of mixed processing, mixed processing will be attained with the laser light of low power. For this reason, in performing mixed processing with a linear velocity equivalent to the conventional initialization, required laser power is very small and ends. However, in order to perform mixed processing at a practical rate, considering as 0.2 VW<=VM is usually desirable.

[0025] The optical recording medium of this invention can also be used as a postscript mold besides the rewritable mold mentioned above. When using the optical recording medium of this invention as a postscript mold, mixed processing of both thin films is not performed. When the approach of rewriting mentioned above is used for the postscript mold record medium in this invention (i.e., when the driving gear for [rewritable] mold record media is used), record cannot be eliminated although it is possible. When record power is added, mixing with Te system thin film and a reaction thin film is specifically possible, and when elimination power is added to the field which mixing produced with the same linear velocity as the time of record, crystallization of the field is impossible. In the optical recording medium of this invention, since it is possible to reduce a reflection factor greatly by mixed processing while being able to make the reflection factor immediately after manufacture comparatively high, by this invention, the good postscript mold optical recording medium of a property with unnecessary and initialization is realized. In addition, the recording layer in which such postscript mold record is possible is realizable by setting up a presentation, thickness, etc. of both thin films suitably.

[0026]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail.

[0027] The optical recording medium of recording layer this invention has the recording layer which consists of a Te system thin film of at least one layer, and a reaction thin film of at least one layer on a transparence substrate. Te system thin film and the reaction thin film have touched into the recording layer.

[0028] Te system thin film forms Te system ingredient whose Te content is more than 97 atom % preferably more than 95 atom % by a spatter etc. As for the thickness of Te system thin film, it is desirable that it is 7nm or more. Even if Te content in Te system thin film is too low and Te system thin film is too thin, crystallization of Te system thin film becomes difficult, and the effectiveness of this invention stops realizing.

[0029] A reaction thin film forms the ingredient with which a phase change ingredient is generated by mixing with Te, and specifically forms a system (germanium, Sb) ingredient. (germanium, Sb) A system ingredient uses germanium as a principal component, uses Sb as a principal component, or uses germanium and Sb as a principal component. (germanium, Sb) What is necessary is just to determine the ratio of germanium and Sb in a system ingredient suitably according to the recording layer presentation made into the object.

[0030] As for Te system thin film and/or a reaction thin film, it is desirable that Element M is included. M is at least one sort of elements chosen from aluminum, Si, Ti, V, Cr, Mn, Fe, Co, nickel, Cu, Zn, Y, Zr, Nb, Mo, Ru, Rh, Pd, Ag, Cd, In, Sn, La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Hf, Ta, W, Au, Tl, Pb, and Bi. Since the stability of an amorphous phase is increased, Element M is added for the purpose of improving S/N of a signal. Since such effectiveness is high, among Elements M, Si, Ti, V, Cr, nickel, Zn, Sn, W, Pb, and Bi are desirable.

[0031] The content of Element M is below 3 atom % more preferably below pentatomic % in the whole recording layer. If M content in the inside of a recording layer is too high, the reflection factor change accompanying a phase change will become small, and enough modulation factors will no longer be

obtained. In order to fully demonstrate the above effectiveness, it is desirable to carry out M content in a recording layer to more than 0.5 atom %.
[0032] In addition, when making Te system ingredient contain Element M, M content in Te system ingredient is preferably made below into 3 atom % below pentatomic %. When M content in Te system ingredient is too high, in case Te system thin film is formed by the spatter, generation of Te fine crystal is controlled with Element M, and crystallization of Te system thin film does not arise, but the effectiveness of this invention stops realizing. As for Te system thin film, it is desirable to consist of Te or Te, and an element M substantially.
[0033] What is necessary is just to determine suitably the thickness of Te system thin film, and the thickness of a reaction thin film according to the presentation of both thin films so that the recording layer presentation (presentation after both thin film mixing) made into the object may be acquired.
[0034] However, 7nm or more of thickness of Te system thin film is 10nm or more more preferably. If Te system thin film is too thin, it will be in an amorphous state, without Te system thin film turning into homogeneous crystalline substance film, and effectiveness of this invention will not be realized. In addition, although the upper limit of the thickness of Te system thin film is determined according to the recording layer thickness needed and the presentation of both thin films, it is usually about 12nm.
[0035] Generally the thickness of a reaction thin film is about 8-11nm. A reaction thin film does not need to be continuation film.
[0036] In addition, the calculated value computed by membrane formation rate x membrane formation time amount expresses the thickness of each thin film on these descriptions.
[0037] Although the recording layer may consist of a Te system thin film of one layer, and a reaction thin film of one layer, it can make energy required for mixing small by considering a recording layer as the configuration of three or more layers. Although a recording layer may be the even number lamination to which the same number laminating of Te system thin film and the reaction thin film was carried out by turns and ends may be the odd number lamination used as a thin film of the same kind when three or more layers of both thin films exist in total in a recording layer, that whose recording layer ends it is odd number lamination and are reaction thin films is the most desirable. Since mixing of both the thin film component is carried out to quick and homogeneity by carrying out to the configuration whose recording layer ends are reaction thin films, i.e., the configuration in which a reaction thin film exists in the both sides of all Te system thin films, energy required for mixing can be made smaller.
[0038] Since a recording layer will become thick too much if there are too many laminatings of both thin films, as for the number of the interfaces between Te system thin films and the reaction thin films in a recording layer, carrying out to ten or less is desirable, and it is more desirable to set up the number of interfaces so that record layer thickness may be set to 50nm or less. If a recording layer is too thick, the heat dissipation effectiveness by the dielectric layer will serve as imperfection, the edge of a record mark will distortion-come to be easy, and it will be easy to cause aggravation of a jitter or an error rate.
[0039] In addition, if a recording layer is too thin, since growth of a crystal phase will become difficult and it will become inadequate reflection factor changing in connection with a phase change, as for record layer thickness, it is desirable to be referred to as 15nm or more.
[0040] It is Formula I about the atomic ratio of the configuration element of the whole recording layer. (GeaSbbTe1-a-b) When expressed with 1-cMc, it is $0 \leq a \leq 1$, $0 \leq b \leq 1$, and $0 \leq c \leq 0.05$ preferably, and is $0.005 \leq c \leq 0.03$ more preferably.
[0041] What is necessary is just to determine a and b suitably in a postscript mold optical recording medium, so that it may have a suitable crystallization rate according to the linear velocity at the time of record.
[0042] On the other hand, a and b in the case of applying to a rewritable mold optical recording medium are $0.05 \leq a \leq 0.25$ and $0.20 \leq b \leq 0.40$ more preferably, and are $0.08 \leq a \leq 0.22$ and $0.22 \leq b \leq 0.33$ still more preferably. In a rewritable mold optical recording medium, if a is too small, it will be hard coming to crystallize a record mark, and the rate of elimination will become low. On the other hand, if a is too large, a lot of Te will combine with germanium, consequently Sb will deposit, and a record mark

will become is hard to be formed. If b is too small, since Te increases too much, at the time of the preservation in an elevated temperature, it becomes easy to crystallize a record mark and dependability will become low. On the other hand, if b is too large, Sb will deposit and a record mark will become is hard to be formed.

[0043] If c is too small, effectiveness by having added Element M will not fully be realized. On the other hand, if c is too large, since it will shift from an eutectic presentation, a crystallization rate will become low rapidly with buildup of c, and the rate of elimination will fall.

[0044] In formation approach above-mentioned each mode of a recording layer, it is desirable to perform each formation of Te system thin film and a reaction thin film by the spatter. Since generation of Te fine crystal is promoted by forming Te system thin film by the spatter, crystallization needed for Te system thin film will be substantially completed in the phase which formation with Te system thin film and a reaction thin film ended. In case especially spatter conditions carry out the spatter of the ingredient which is not limited, for example, contains two or more elements, they may use an alloy target and may use the plural spatters using a target two or more. In addition, although Te system thin film and a reaction thin film may form whichever first, when using as a postscript mold, they form Te system thin film previously so that Te system thin film may exist in a record light incidence side. By carrying out formation sequence in this way, the so-called High To Low record of record before to which the record back serves as a low reflection factor is attained with a high reflection factor.

[0045] Since crystallization of Te system thin film can be advanced if a recording layer is heat-treated when the crystallinity of formed Te system thin film is inadequate, you may heat-treat if needed for acceleration of crystallization. As for the heat treatment temperature at this time, it is desirable to consider as 50-120 degrees C. If heat treatment temperature is too low, the time amount which crystallization takes will become long too much. On the other hand, if heat treatment temperature is too high, a damage will be given to a substrate when resin substrates, such as a polycarbonate, are used. Although especially heat treatment time amount is not limited since what is necessary is just to perform heat treatment until improvement in a reflection factor is saturated, it is usually 3 hours or more preferably for 1 hour or more. What is necessary is just to perform this heat treatment by heating the whole optical recording medium in oven etc.

[0046] The above-mentioned heat treatment is effective especially when applying this invention to the optical recording medium of a postscript mold. Since it does not perform mixed processing in applying this invention to a postscript mold optical recording medium, extent of crystallization of Te system thin film becomes important. Since the reflection factor difference between a record mark and its perimeter can be enlarged so that crystallization of Te system thin film is progressing, a high modulation factor is obtained. Moreover, the above-mentioned heat treatment is effective also in stabilization of the record reproducing characteristics in a postscript mold optical recording medium. Since the temperature of the perimeter of a record mark also rises in case a record mark is formed by record light exposure, crystallization of the perimeter will progress that crystallization of Te system thin film is inadequate at the time of record mark formation, and a reflection factor will increase. For this reason, the wave of a regenerative signal deforms and it becomes the cause of aggravation of a jitter or an error. On the other hand, if Te system thin film is fully crystallizing and a reflection factor is in a saturation state substantially, reflection factor lifting in the perimeter of a record mark will not be produced.

[0047] In addition, since it can solve by controlling the conditions of mixed processing etc. even if crystallization of Te system thin film is inadequate when applying this invention to a rewritable mold optical recording medium, the above-mentioned heat treatment is usually applied only to a postscript mold optical recording medium. However, even when it applies to a rewritable mold optical recording medium, there is an advantage that the focus servo of a laser beam becomes easy, in the case of mixed processing.

[0048] The above-mentioned heat treatment also serves as an index of extent of crystallization of Te system thin film. When it will be said that crystallization of Te system thin film is inadequate when the reflection factor of a recording layer improves by the above-mentioned heat treatment and the reflection factor of a recording layer does not improve by the above-mentioned heat treatment, either (i.e., when

the reflection factor is saturated), it will fully crystallize. However, if it is 95% or more of a reflection factor after the reflection factor before heat treatment heat-treating, since it can say that it is sufficient property practical, it can also be used without heat-treating.
[0049] As for mixed processing and the mixed processing to the optical recording medium of rewriting this invention, it is desirable to carry out by laser light exposure, as mentioned above. In addition, although mixed processing is possible also by heat-treating the whole optical recording medium in oven etc., since comparatively hot heat treatment is required in order to produce counter diffusion sufficient between Te system thin film and a reaction thin film, it becomes difficult to use a cheap resin substrate.
[0050] Rewriting to the optical recording medium of this invention is performed as mentioned above. Record power may be added in the shape of a pulse. Since the accumulation in a record mark is controlled and bulging (teardrop phenomenon) of the record mark back end section can be stopped by recording one signal by at least two exposures, C/N improves. Moreover, the rate of elimination also improves by pulse-like exposure. The concrete value of record power and elimination power can be determined experimentally. In addition, the thing of the low power which does not affect the crystallized state of a recording layer is used for the laser light for playback.
[0051] the linear velocity of a recording layer [as opposed to laser light on the occasion of record to the optical recording medium of this invention] -- usually -- 0.8-20 -- it is 1.2 - 16 m/s preferably about m/s. The rewritable optimal linear velocity is controllable by changing the presentation of a recording layer. Specifically, the rewritable optimal linear velocity can be made quick by making Te content high.
[0052] The optical recording medium of this invention can choose from a large wavelength region, for example, the range of 100-5000nm, the light used for mixed processing, rewriting, and playback free.
[0053] The example of a configuration of the record medium of optical-recording-medium this invention of the medium structural drawing 1 is shown in drawing 1 . This optical recording medium is an one side record mold (veneer mold) medium which formed the 1st dielectric layer 31, a recording layer 4, the 2nd dielectric layer 32, the reflecting layer 5, and the protective layer 6 on the base 2 at this order. In addition, this invention is applicable also to the medium of the double-sided record mold pasted up by the glue line so that two protective layers 6 might become inside using this one side record mold medium. Moreover, this invention is applicable also to the medium on which the above-mentioned one side record mold medium and the protective group object were pasted up by the glue line.
[0054] In a dielectric layer 31 and 32 drawing 1 , the 1st dielectric layer 31 intercepts the heat which prevents oxidation of a recording layer and is transmitted from a recording layer to a base at the time of record, and protects a base. The 2nd dielectric layer 32 is formed after record in order to emit the heat which remained in the recording layer by heat conduction, while protecting a recording layer. Moreover, a modulation factor can be raised by preparing both dielectric layers.
[0055] Especially the dielectric materials used for the 1st dielectric layer and the 2nd dielectric layer may use various glass etc. that what is necessary is not to be limited but just to use various transparent ceramics, such as various dielectrics, those mixture, for example, silicon oxide, silicon nitride, and ZnS-SiO2. Moreover, for example, the so-called LaSiON containing La, Si, O, and N, the so-called SiAlON containing Si, aluminum, O, and N or SiAlON containing Y, etc. can be used preferably.
[0056] However, it is desirable to make either [at least] the 1st dielectric layer or the 2nd dielectric layer contain zinc sulfide for optimization of properties, such as a refractive index. Hereafter, the dielectric layer containing zinc sulfide is called ZnS content dielectric layer. It is desirable to make a ZnS content dielectric layer contain an element (henceforth a metallic element A) with the sulfide generation standard free energy lower than ZnS generation standard free energy in 0-1000 degrees C. Since S isolation in the case of repeat over-writing can be controlled and jitter buildup can be prevented by this by making a metallic element A contain in a ZnS content dielectric layer, the count in which repeat over-writing is possible can be increased.
[0057] As a metallic element A, it is desirable to use at least one sort of Ce, calcium, Mg, Sr, Ba, and Na, and since sulfide generation standard free energy is small, especially the thing for which Ce is used is desirable. 300K -- ZnS generation standard free energy -- about -230 kJ/mol and CeS generation standard free energy -- about -540 kJ/mol and CaS generation standard free energy -- about -510 kJ/mol

and MgS generation standard free energy -- about -390 kJ/mol and SrS generation standard free energy -- about -500 kJ/mol and BaS generation standard free energy -- about -460 kJ/mol and Na2S generation standard free energy -- about -- it is -400 kJ/mol.

[0058] The ratio of the metallic element A to all metallic elements is [be / it / under / ZnS content dielectric layer / setting] below 1.3 atom % more preferably below 1.5 atom % under 2 atom %. If the ratio of a metallic element A is too high, effectiveness which controls the jitter buildup produced by repeat over-writing will not be realized. In addition, in order to fully realize effectiveness by addition of a metallic element A, the ratio of a metallic element A is more preferably carried out to more than 0.03 atom % more than 0.01 atom %. The ratio of the metallic element A in [all] a metallic element can be measured by X-ray fluorescence, EPMA (electron ray probe X-ray microanalysis), etc. In addition, in case the ratio of a metallic element A is computed, semimetals, such as Si, are also treated as a metallic element.

[0059] The metallic element A may exist with which gestalten, such as a simple substance, a sulfide, an oxide, and a fluoride, in a dielectric layer.

[0060] To a ZnS content dielectric layer, it is desirable that compounds other than zinc sulfide, for example, various oxides, the nitride, the fluoride, etc. contain. As such a compound, at least one sort of silicon oxide (SiO2, SiO), tantalum oxide (Ta 2O5), titanium oxide (TiO2), lanthanum trioxide (La 2O3), silicon nitride (Si3N4), alumimium nitride (AlN), magnesium fluoride (MgF2), sodium-fluoride (NaF), and thorium fluoride (ThF4) is desirable, for example.

[0061] the content of the zinc sulfide in a ZnS content dielectric layer -- desirable -- 50-95-mol % -- it is 70-90-mol % more preferably. If there is too little ZnS, while thermal conductivity becomes high too much, a refractive index will become small too much, and high [C/N] will become is hard to be obtained. On the other hand, if there is too much ZnS, over-writing endurance will become low. The ZnS content in a dielectric layer is determined based on the amount of S and the amount of Zn which were calculated by X-ray fluorescence etc., for example, to S, when Zn is superfluous, it shall contain superfluous Zn as other compounds, for example, ZnO.

[0062] In addition, although the configuration which makes a metallic element A contain in a ZnS content dielectric layer was explained above, it is good also as a configuration which prepares the interlayer containing a metallic element A between a ZnS content dielectric layer and a recording layer. As such an interlayer, the thing which consists of a cerium oxide (CeO2) simple substance, or the thing which consists of ZnS-CeO2 mixture is mentioned, for example.

[0063] When using either the 1st dielectric layer or the 2nd dielectric layer as a ZnS content dielectric layer, especially the dielectric materials used for the dielectric layer of another side, i.e., the dielectric layer which does not contain zinc sulfide, are not limited, but should just use the various above-mentioned dielectrics other than ZnS.

[0064] As for especially the refractive index of the 1st dielectric layer and the 2nd dielectric layer, it is [1.4 or more] desirable in the range with a wavelength of 400-850nm that it is 1.8 or more. The above-mentioned wavelength range is wavelength range preferably used to the optical recording medium of this invention including 780nm which is the operating wavelength of a current CD player, and 630-680nm to which utilization is advanced as next-generation record wavelength.

[0065] 50-300nm of thickness of the 1st dielectric layer 31 is 100-250nm more preferably. By making the 1st dielectric layer into such thickness, the base breakage on for record can be prevented effectively, and, moreover, a modulation factor also becomes high. 10-30nm of thickness of the 2nd dielectric layer 32 is 13-20nm more preferably. Since a cooling rate becomes quick by making the 2nd dielectric layer into such thickness, the edge of a record mark becomes clear and a jitter decreases. Moreover, a modulation factor can be made high by considering as such thickness.

[0066] As for each dielectric layer, it is desirable to form by vapor growth, such as a spatter and vacuum deposition. Various approaches can be used in order to make a metallic element A contain in a dielectric layer. For example, when a metallic element A is Ce, what carried the chip which consists of a Ce simple substance or CeO2 on the main target used as the principal component of a dielectric layer may be used as a target, and you may make it contain as a Ce compound of CeO2 or others in the main target.

Moreover, when using calcium and Mg as a metallic element A, the chip which consists of CaO or MgO is carried on the above-mentioned main target, and it is good for it also as a target, but since there is deliquescence in these, it is not desirable. Therefore, it is desirable to carry the chip which consists of CaF2 or MgF2 on the main target in this case, and to consider as a target. It is more desirable to use a fluoride chip in respect of [chip / oxide] deliquescence, also when using Sr, Ba, Na, etc. as a metallic element A. Moreover, calcium, Mg, Sr, Ba, and Na are made to contain in the main target as an oxide or compounds other than this, and may be used. In addition, multicomponent targets, such as ZnS-SiO2, may be used for the main target, and plural spatters which use ZnS and SiO2 independently as a main target, respectively may be used for it.

[0067] Although you may form by the spatter usual in the inside of Ar, a ZnS content dielectric layer performs a spatter in the mixed ambient atmosphere of Ar and O2 preferably, when making the above-mentioned metallic element A contain. By performing a spatter in such a mixed ambient atmosphere, the effectiveness of suppressing the jitter buildup at the time of repeat over-writing becomes higher. Especially when carrying the chip which consists of a metallic element A simple substance on the above-mentioned main target and performing a spatter, it is effective, but the O2 installation at the time of a spatter is effective, also when putting the chip which consists of a compound of a metallic element A on the main target or making the main target contain the compound of a metallic element A. When the amount of O2 installation to the inside of a spatter ambient atmosphere is expressed with flow rate O2/ (Ar+O2), this flow rate is 25% or less more preferably 30% or less. If there are too many amounts of O2 installation, although record power falls, since elimination power does not change, an elimination power margin becomes narrow to the degree of pole, and is not desirable. In addition, in order to fully demonstrate the effectiveness by O2 installation, the above-mentioned flow rate is more preferably made into 10% or more 5% or more.

[0068] The configuration of recording layer 4 recording layer is as having mentioned above.

[0069] What is necessary is just to usually consist of high reflection factor metals, such as an alloy containing simple substances, such as aluminum, Au, Ag, Pt, and Cu, or these one or more sorts, although especially the construction material of reflecting layer 5 reflecting layer is not limited. As for the thickness of a reflecting layer, it is desirable to be referred to as 30-200nm. It is hard coming to obtain sufficient reflection factor with thickness being said under range. Moreover, even if it exceeds said range, the improvement in a reflection factor is small and becomes disadvantageous in cost. As for a reflecting layer, it is desirable to form by vapor growth, such as a spatter and vacuum deposition.

[0070] Protective layer 6 protective layer is prepared for improvement in abrasion-proof nature or corrosion resistance. Although it is desirable to consist of matter of various organic systems as for this protective layer, it is desirable to consist of matter which stiffened a radiation-curing mold compound and its constituent with radiations, such as an electron ray and ultraviolet rays, especially. Protection layer thickness is about 0.1-100 micrometers, and should just usually form a spin coat, gravure spreading, a spray coat, dipping, etc. by the usual approach.

[0071] Especially the adhesives that constitute a glue line glue line may not be limited, for example, may be any, such as hot melt adhesive, ultraviolet curing mold adhesives, and room-temperature-setting mold adhesives, and may be binders.

[0072] Other examples of a configuration of the optical recording medium of this invention are shown in optical-recording-medium drawing 2 of drawing 2 . It is possible to control the jitter buildup by over-writing in the optical recording medium of this configuration. On these descriptions, the optical recording medium of this configuration is called medium of absorption coefficient amendment structure. Hereafter, the reason for choosing absorption coefficient amendment structure is explained.

[0073] In the phase change mold optical recording medium, in order to use the difference in the reflection factor between crystal-amorphous, the rate of optical absorption (Ac) in fields other than a record mark (crystallized state) differs from the rate of optical absorption (Aa) in a record mark (amorphous condition) in many cases, and, generally it has become Ac<Aa. In addition, each of Ac(s) and Aa(s) is the values in the wavelength of the laser light for record playback. For this reason, record sensibility will differ from the rate of elimination by whether the over-writing field was a crystal or it

was amorphous. Consequently, dispersion in die length and width of face may arise to the record mark formed of over-writing, a jitter may become large, and it may become an error. Since it is easy to be influenced of fluctuation by the die length of a record mark when mark edge record which makes the ends of a record mark support information for densification is being performed, an error will increase further.

[0074] In order to solve this problem, it is desirable to bring Ac close to Aa, and it is desirable for it to be more preferably referred to as Ac/Aa>=0.9, to be referred to as Ac/Aa>=1 still more preferably, and to be most preferably referred to as Ac/Aa>1 in consideration of the effect of the latent heat. Although what is necessary is for that just to control the dielectric layer thickness prepared on both sides of a recording layer or it, by the medium of the usual structure, the problem that the difference of the reflection factor (Rc) from the medium in fields other than a record mark and the reflection factor (Ra) from the medium in a record mark will become small if Ac/Aa is enlarged, and C/N becomes low will arise.

[0075] By JP,8-124218,A, in the optical information record medium of a configuration of having carried out the laminating of the 1st dielectric layer, a recording layer, the 2nd dielectric layer, a reflecting layer, the 3rd dielectric layer, and the ultraviolet-rays hardening resin layer to order on the base, it considers as Ac>Aa and the proposal of the purport using the dielectric with a bigger refractive index as the 3rd dielectric layer than 1.5 is made from such a situation using a penetrable ultra-thin metal membrane, and Si or germanium as a reflecting layer, for example. By preparing the reflecting layer of light transmission nature, and the 3rd dielectric layer of a high refractive index, it becomes possible to make Ac/Aa into the above-mentioned range, keeping Rc-Ra large.

[0076] In addition, Ac and Aa are computable from the optical constant of each class, such as a recording layer, a dielectric layer, and a reflecting layer, and the wavelength of the laser light for record playback.

[0077] The optical recording medium shown in drawing 2 is an one side record mold medium which considered the reflecting layer 5 as the same configuration as the reflecting layer indicated by above-mentioned JP,8-124218,A, and formed the 3rd dielectric layer 33 between the reflecting layer 5 and the protective layer 6. Also in this configuration, like the one side record mold medium shown in drawing 1 , two sheets are pasted up, it may consider as a double-sided record mold medium, or a protective group object may be pasted up.

[0078] As for a reflecting layer 5, in drawing 2 , it is desirable to consist of Si, germanium, etc. with high permeability which are covered over an infrared region from near-infrared [in which it consists of ultra-thin metal layers with high light transmittance, or record / playback wavelength is contained]. What is necessary is just to determine suitably that the thickness of a reflecting layer can amend the absorption coefficient difference between fields other than the record mark of a recording layer, and a record mark. What is necessary is just to determine thickness suitably according to a component, since the desirable thickness range of a reflecting layer changes greatly with components. For example, in using metals, such as Au, it sets more preferably 40nm or less of thickness of a reflecting layer to 10-30nm, and in using Si or germanium, it sets more preferably 80nm or less of thickness of a reflecting layer to 30-70nm. If a reflecting layer is too thin, lowering of C/N will be caused, and the absorption coefficient amendment effectiveness mentioned above when the reflecting layer was too thick serves as imperfection.

[0079] When it constitutes a reflecting layer from a metal, Au or Au alloy is desirable. What uses Au as a principal component and contains at least one sort of aluminum, Cr, Cu, germanium, Co, nickel, Mo, Ag, Pt, Pd, Ta, Ti, Bi, and Sb as an Au alloy is desirable.

[0080] Also as for this reflecting layer, it is desirable to form by vapor growth, such as a spatter and vacuum deposition.

[0081] The 3rd dielectric layer 33 prepared if needed on a reflecting layer 5 consists of desirable ingredients with a refractive index higher than a protective layer 6. Said Ac/Aa can be enlarged keeping large the reflection factor difference between a record mark and the other field like invention given [said] in JP,8-124218,A by preparing such 3rd dielectric layer.

[0082] What is necessary is just to choose the component of the 3rd dielectric layer from the various dielectrics mentioned in explanation of the 1st dielectric layer and the 2nd dielectric layer. However, since the 3rd dielectric layer is not in contact with a recording layer, it does not need to make the above-mentioned metallic element A contain.
[0083] The 30-120nm of the 3rd dielectric layer thickness is 40-90nm more preferably. If the 3rd dielectric layer is too thin, a signal output will become low, and if too thick, the phenomenon (cross erasion) in which the signal of an adjoining truck is eliminated will arise.
[0084] As described above, with the structure which controls Ac and Aa, a part of laser light for record playback irradiated from the transparence substrate bottom usually penetrates, and outgoing radiation is carried out from a reflecting layer side. Especially the ratio of the transmitted light to the permeability at this time, i.e., incident light, is usually about 3% or more about 1% or more. In addition, this permeability is the value measured in the condition that only an inorganic layer exists on a transparence substrate. That is, with the configuration of drawing 2 , it is in the condition except a protective layer 6, and the permeability as a result of the multiple echo between inorganic layers, such as a recording layer, a dielectric layer, and a reflecting layer, is meant. This permeability can be measured with a spectrophotometer. What is necessary is not to limit especially the field to measure, but just to usually measure in the crystalline substance field (mirror section) in which a groove does not exist, although it may be the crystalline substance section or you may be the amorphous section.
[0085] In the optical recording medium shown in drawing 2 , a base 2, the 1st dielectric layer 31, a recording layer 4, the 2nd dielectric layer 32, and a protective layer 6 should just be taken as the same configuration as the optical recording medium shown in drawing 1 .
[0086]
[Example] Hereafter, the concrete example of this invention is shown and this invention is further explained to a detail.
[0087] The 1st dielectric layer 31, a recording layer 4, the 2nd dielectric layer 32, the reflecting layer 5, and the protective layer 6 were formed in the front face of the disk-like polycarbonate base 2 with a diameter [of 120mm] which carried out simultaneous formation of the groove with example 1 injection molding, and a thickness of 0.6mm, and it considered as the optical recording disk which has the configuration of drawing 1 . The groove was set to width-of-face [of 0.74 micrometers], depth [of 65nm], and pitch 1.48micrometer.
[0088] The 1st dielectric layer 31 was formed by the spatter by using ZnS and SiO2 as a target. SiO2/(ZnS+SiO2) could be 15-mol %. Thickness of the 1st dielectric layer 31 was set to 175nm.
[0089] Next, the reaction thin film (germanium0.5Sb0.5) with a thickness of 9nm was continuously formed in Te system thin film (Te100%) with a thickness of 11nm by the spatter, and it considered as the recording layer 4. The presentation of a reaction thin film was measured by ICP. In addition, the example of this description has expressed all presentations related to a recording layer by the atomic ratio. After the record stratification, when electron diffraction investigated the crystallized state, it was checked that Te system thin film is crystallizing. On the other hand, the reaction thin film was amorphous.
 [0090] The 2nd dielectric layer 32 was formed like the 1st dielectric layer 31. Thickness of the 2nd dielectric layer 32 was set to 20nm.
[0091] The reflecting layer 5 used aluminum-Cr for the target, formed it by the spatter, and set thickness to 150nm. With the spin coat method, after spreading, the protective layer 6 hardened ultraviolet curing mold resin by UV irradiation, and formed it. The protective layer thickness after hardening was 5 micrometers.
[0092] Thus, the produced phase change mold optical recording disk was set to sample 1A.
[0093] Sample 1B was produced like sample 1A except having used the alloy target and having formed the recording layer of monolayer structure for the comparison. The record layer thickness of sample 1B should presuppose that it is the same as the sum total thickness of Te system thin film of sample 1A, and a reaction thin film, and the presentation of the recording layer of sample 1B should set Te system thin film and the reaction thin film of sample 1A.
[0094] Sample 1A was [sample 1B of the reflection factor (R0) of each sample immediately after

manufacture] 7.9% 16.7%. In addition, the reflection factor in the example of this description is the value calculated by converting the RF-signal output of a disk evaluator, when carrying out incidence of the playback light through a substrate. Moreover, especially measurement wavelength is 637nm unless it refuses.

[0095] Next, processing and assessment following by the wavelength of 637nm and the disk evaluator of NA0.6 were performed to each sample. In addition, the record signal was set to 1-7RLL, and performed the division of timer pulse period.

[0096] First, the recording layer was initialized by irradiating laser light with an output of 8mW, rotating sample 1B with the linear velocity of 2m/s (crystallization). The reflection factor was improving to 16.8% after initialization. Moreover, after initialization, when the rewritable optimal linear velocity was measured, it was 6 m/s. Therefore, the linear velocity in the case of initialization is set to one third of the rewritable optimal linear velocity. In addition, when linear velocity in the case of initialization was made into the same 6 m/s as a rewritable linear velocity, it was not able to be crystallized.

[0097] Next, laser light with an output of 5mW was irradiated, rotating sample 1A in s in 6m /. As for the reflection factor, it turned out after the laser light exposure that it fell to 12.8% and Te system thin film and the reaction thin film were mixed. It was 6 m/s when the optimal linear velocity which can rewrite sample 1A was investigated. Therefore, it turns out with the same linear velocity as the rewritable optimal linear velocity that mixed processing was possible for.

[0098] To sample 1A after mixed processing, and change of the reflection factor accompanying over-writing was investigated. [record power 11mW and elimination power 5mW] A result is shown in drawing 3 R> 3. The reflection factor Rtop of the elimination section and the reflection factor Rbottom of a record mark are shown in drawing 3 . In sample 1A, the reflection factor (RC) of the crystalline substance section was [the reflection factor (RA) of the amorphous section] 8.4% 17.8% after 10 times over-writing. Drawing 3 shows that the reflection factor stabilized henceforth [the 2nd over-writing] is obtained. Moreover, since the power and elimination power at the time of mixed processing are the same and the rewritable optimal linear velocity is the same as the linear velocity at the time of mixed processing, mixed processing is understood that it is possible to carry out promptly moreover by low power compared with initialization.

[0099] On the other hand, when over-writing with the same said of sample 1B was performed, the reflection factor (RA) of the amorphous section of the reflection factor (RC) of the crystalline substance section was 8.0% 17.0% after ten over-writing.

[0100] Example 2 recording layer was made into 3 lamination, and also sample 2A was produced like sample 1A of an example 1. The recording layer was formed from the substrate side in order of the reaction thin film, Te system thin film, and the reaction thin film. Te system thin film set thickness to 11nm by sample 1A and this presentation, and the reaction thin film set thickness to 4.5nm by sample 1A and this presentation. The overall thickness of a recording layer is set to the same 20nm as sample 1A. It was checked as a result of electron diffraction that Te system thin film is crystallizing. On the other hand, the reaction thin film was amorphous. The reflection factor (R0) of sample 2A was 15.7%.

[0101] Mixed processing was performed by linear-velocity [of 6m/s], and power 5mW like sample 1A to sample 2A. The reflection factor after mixed processing was 13.4%. After mixed processing, when the rewritable optimal linear velocity was investigated, it was 6 m/s.

[0102] To sample 2A after mixed processing, and change of the reflection factor accompanying over-writing was investigated. [like sample 1A] A result is shown in drawing 4 . In sample 2A, the reflection factor (RC) of the crystalline substance section was [the reflection factor (RA) of the amorphous section] 8.6% 17.0% after ten over-writing. Drawing 4 shows that change of the reflection factor of sample 2A by over-writing is smaller than the case of sample 1A shown in drawing 3 . It is thought that mixing of both thin films was carried out to quicker than sample 1A and homogeneity, and the reflection factor was stabilized from the first stage by it since the recording layer of sample 2A was the structure where a reaction thin film exists in the both sides of Te system thin film.

[0103] The presentation of an example 3 reaction thin film was set to germanium0.485Sb0.485Sn0.03, and also sample 3A was produced like sample 1A. The reflection factor (R0) of sample 3A was 16.0%.

[0104] Mixed processing was performed by linear-velocity 5 m/s and power 4mW to sample 3A. The reflection factor after mixed processing was 12.0%. After mixed processing, when the rewritable optimal linear velocity was investigated, it was 5 m/s.
[0105] When the over-write like sample 1A to sample 3A after mixed processing, the reflection factor (RA) of the amorphous section of the reflection factor (RC) of the crystalline substance section was 6.8% 17.0% after ten over-writing. The reflection factor was stabilized in about five over-writing.
[0106] an example 4 -- first, formed Te system thin film (Te100%) with a thickness of 10nm by the spatter, subsequently formed the reaction thin film (germanium100%) with a thickness of 10nm by the spatter, and considered as the recording layer, and set the 1st dielectric layer thickness to 70nm, and thickness of a reflecting layer was set to 50nm, and also sample 4A was produced like sample 1A. The reflection factor (R0) of sample 4A was 20.0%. It was checked as a result of electron diffraction that Te system thin film is crystallizing. On the other hand, the reaction thin film was amorphous.
[0107] Next, rotating sample 4A by linear-velocity 10 m/s, elimination power was not added but the 1-7RLL signal was recorded by record power 6mW. The reflection factor in the amorphous section of a record mark was 11%.
[0108] About sample 4A after record, when laser light was irradiated with the same linear velocity of 10m/s as the time of record, it was not based on the power of laser light and a record mark was not able to be eliminated (crystallization). The time of making linear velocity late to 1 m/s became eliminable.
[0109] This result shows that it is realizable without initialization actuation of a phase change mold optical recording medium usable as a postscript mold in this invention.
[0110] The effectiveness of this invention is clear from the result of each above example.
[0111] The 1st dielectric layer 31, a recording layer 4, the 2nd dielectric layer 32, a reflecting layer 5, the 3rd dielectric layer 33, and a protective layer 6 were formed in the front face of the disk-like polycarbonate base 2 with a diameter [of 120mm] which carried out simultaneous formation of the groove with example 5 injection molding, and a thickness of 0.6mm, it considered as the optical recording disk which has the configuration of drawing 2 , and this was set to sample 5A. The groove was set to width-of-face [of 0.60 micrometers], depth [of 50nm], and pitch 1.20micrometer.
[0112] Thickness was set to 130nm, and also the 1st dielectric layer 31 was formed like sample 1A. Thickness was set to 15nm, and also the 2nd dielectric layer 32 was formed like sample 1A. The reflecting layer 5 set thickness to 50nm, used Si for the target, and formed it by the spatter in Ar ambient atmosphere. The 3rd dielectric layer 33 set thickness to 60nm, used ZnS(85-mol %)-SiO2 (15-mol %) for the target, and formed it by the spatter in Ar ambient atmosphere. The protective layer 6 was formed like sample 1A.
[0113] The recording layer 4 was made into 3 lamination of the same order of a laminating as sample 2A. However, thickness of Te system thin film was set to 8.8nm, and thickness of a reaction thin film was set to 3.6nm. The overall thickness of a recording layer is set to 16nm. It was checked as a result of electron diffraction that Te system thin film is crystallizing. On the other hand, the reaction thin film was amorphous.
[0114] It was 55.0%, when laser light with a wavelength of 680nm was irradiated from the base 2 side in the condition except the protective layer 6 of sample 5A and the permeability in the mirror section (crystalline substance) was measured with the spectrophotometer. In addition, Ac/Aa in the wavelength of 680nm of sample 5A is set to 1.25.
[0115] The reflection factor (R0) of sample 5A immediately after manufacture was 21.0%. In addition, the reflection factor measurement wavelength in this example is 680nm.
[0116] Next, laser light (wavelength of 680nm) with an output of 8mW was irradiated, rotating sample 5A in s in 12m /. As for the reflection factor, it turned out after the laser light exposure that it fell to 18.3% and Te system thin film and the reaction thin film were mixed. It was 12 m/s when the optimal linear velocity which can rewrite sample 5A was investigated. Therefore, it turns out with the same linear velocity as the rewritable optimal linear velocity that mixed processing was possible for.
[0117] When record reproducing characteristics were investigated to sample 5A after mixed processing, the property stabilized from the first stage was acquired like sample 2A.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the fragmentary sectional view showing the example of a configuration of the optical recording medium of this invention.
[Drawing 2] It is the fragmentary sectional view showing the example of a configuration of the optical recording medium of this invention.
[Drawing 3] It is a graph showing the reflection factor Rtop of the crystalline substance section when an over-write [optical recording medium / phase change mold] repeatedly, and the reflection factor Rbottom of the amorphous section.
[Drawing 4] It is a graph showing the reflection factor Rtop of the crystalline substance section when an over-write [optical recording medium / phase change mold] repeatedly, and the reflection factor Rbottom of the amorphous section.
[Description of Notations]
2 Base
31 1st Dielectric Layer
32 2nd Dielectric Layer
33 3rd Dielectric Layer
4 Recording Layer
5 Reflecting Layer
6 Protective Layer

[Translation done.]

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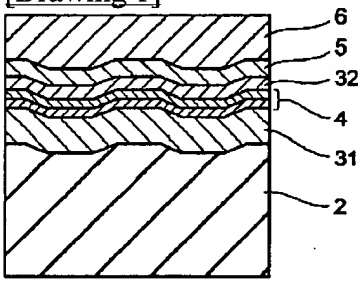
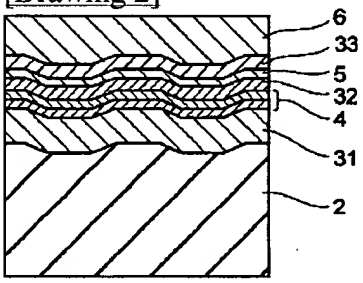
DRAWINGS

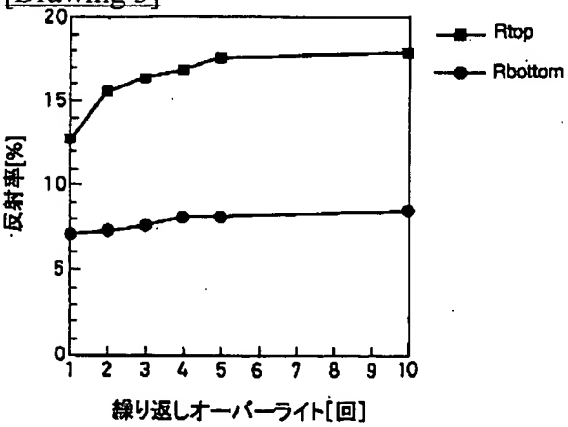
[Drawing 1]



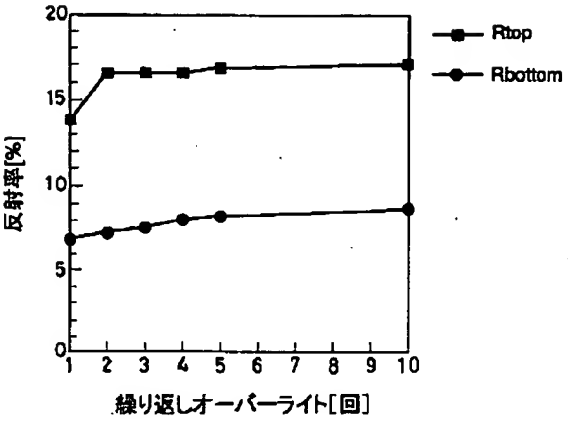
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]